**Math 161 - Team Homework #3**

* **Due Date:**  Monday, 2nd November, 5 pm
* Do not forget to rotate roles and include a reporter’s page each week.
* Show ALL your work.
1. Draw a graph of the derivative of the function *h*(*x*) shown below. Note that *h*(*x*) has a vertical asymptote at *x* = 4.

*x*

*y*

1

2

3

4

5

6

-1

-2

-3

-4

-5

-6

1

2

3

-1

-2

-3

*h*

(

*x*

)

1. Albertine is using the math department’s 3D printer to make (spherical) globes. Suppose that the time it takes to print a globe is a function of the radius of the globe. Let *T*(*R*) be the number of minutes it takes to print a globe of radius *R* centimeters. Assume that the function *T* is invertible, and that both *T* and *T*−1 are differentiable.
	1. For each of the following three parts, your answers should be in terms of one or more of the functions$ T, T^{-1}, T^{'}, and \left(T^{-1}\right)^{'}$*.*
		1. Write a mathematical equation that expresses the following statement.

*In half an hour, the printer can print a globe of radius 2 feet.*

* + 1. Write a mathematical equation that supports the following statement.

*Printing a globe of radius 8.2 inches takes approximately*

*2 more minutes than printing a globe of radius 7.4 inches.*

* + 1. Write a mathematical statement that supports the following fact.

*The smaller the radius of the globe, the less time it takes to print.*

* 1. In the context of this problem, give a practical interpretation of the mathematical statement

$\left(T^{-1}\right)'$(18) = 0*.*4*.*

*Remember to use a complete sentence and include units.*

* 1. Which of the three following possibilities do you think is most likely? You may use your physical intuition, but be sure to explain your reasoning.

 $T'$ (4) *<* $T'$(14) $T'$(4) = $T^{'}$(14) $T'$(4) *>* $T'$(14)

1. A graph of a differentiable function *g*(*x*) and its tangent lines at *x* = 1 and *x* = 3*.*5 is shown below. The two tangent lines are perpendicular. To the right is a table of some values of *g*.

*y*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *x**y*=*g*(*x*)*Q*13.541.5 |

|  |  |
| --- | --- |
| *x* | *g*(*x*) |
| 1.1 | 3.805 |
| 1.01 | 3.98005 |
| 1.001 | 3.9980005 |
| 1.0001 | 3.999800005 |

 |

Use this information to estimate each of the following:

* 1. $g'(1)$
	2. The coordinates of the point *Q*
	3. $g'(3.5)$
	4. *g*(3*.*5)